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PATENT COOPERATION TREATY

PCT/CA 2003/001312

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REC'D 17 MAY 2006

INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)



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Applicant's or agent's file reference 111111	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/CA2003/001312	International filing date (day/month/year) 29.08.2003	Priority date (day/month/year) 29.08.2003
International Patent Classification (IPC) or both national classification and IPC H02J3/06		
Applicant PATEL, Sureshchandra		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 8 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
 These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(II) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the international application
 - VIII ☐ Certain observations on the international application

Date of submission of the demand 16.07.2005	Date of completion of this report 08.12.2005
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Lorenzo Feijoo, S Telephone No. +49 89 2399-7993 

08-12-2005

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**International application No. **PCT/CA2003/001312****I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17):*

Description, Pages

1-20 as originally filed

Claims, Numbers

1-11 as originally filed

Drawings, Sheets

1/6-6/6 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:
- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

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5. ☒ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

see separate sheet

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-8
	No: Claims	9-11
Inventive step (IS)	Yes: Claims	1-8
	No: Claims	9-11
Industrial applicability (IA)	Yes: Claims	1-11
	No: Claims	

2. Citations and explanations

see separate sheet

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Re Item I**Basis of the report**

1. The application has been amended as follows: The whole description and claims have been entirely amended and part of the figures have been replaced.
2. It appears that some of said amendments introduces subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT. As example, see below cited passages of the amended description and claims:
 - pg 3, step- 10 ("read data of maximum and minimum reactive power generation...")
 - pg 3, step-60 ("running overload and under/voltage...")
 - pg 10 and 15, step n
 - claim 1 has been generalised (removal of features regarding the load-flow computation and the restricting nodal transformation angle) and new features have been added ("reading data of PV-node generators maximum and minimum reactive power generation capability limits..."; "calculate... tap positions of tap-changing transformers...").

Furthermore, the applicant provides indications about the amendments but he does not explain where the basis for said amendments can be found in the originally filed application.

For the reasons mentioned above, said amendments will be disregarded for the purpose of assessing novelty and inventive step.

Re Item V**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Reference is made to the following document:
D1: DAS J C: "Reactive power flow control and compensation in the industrial distribution systems" INDUSTRIAL AND COMMERCIAL POWER SYSTEMS TECHNICAL CONFERENCE, 1993. CONFERENCE RECORD, PAPERS PRESENTED AT THE 1993 ANNUAL MEETING ST. PETERSBURG, FL, USA 2-6 MAY 1993, NEW YORK, NY, USA, IEEE, US, 2 May 1993 (1993-05-02),

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pages 128-136, XP010110112 ISBN: 0-7803-0937-5

D2: CA-A-2 107 388 (PATEL SURESHCHANDRA B) 10 May 1995 (1995-05-10)

D3: PATEL S B: "FAST SUPER DECOUPLED LOADFLOW" IEE PROCEEDINGS
C. GENERATION, TRANSMISSION, DISTRIBUTION, INSTITUTION OF
ELECTRICAL ENGINEERS. STEVENAGE, GB, vol. 139, no. 1, 1992, pages
13-20, XP000249444 ISSN: 0143-7046D4: ROY L ET AL: "Comparative study of two iterative schemes applied to
decoupled load flow methods" ENERGY MANAGEMENT AND POWER
DELIVERY, 1995. PROCEEDINGS OF EMPD '95., 1995 INTERNATIONAL
CONFERENCE ON SINGAPORE 21-23 NOV. 1995, NEW YORK, NY,
USA, IEEE, US, 21 November 1995 (1995-11-21), pages 277-282,
XP010161556 ISBN: 0-7803-2981-3

2. The application contains **2 independent method claims**: 1 and 9.
 - 2.1 The claims should be recast to be clearly formulated and to include only the minimum necessary number of independent claims in any one category followed by dependent claims covering features which are merely optional (Rule 6.4 PCT). In the present case it is considered appropriate to use only one independent claim per category.
 - 2.2 If, however, an amended set of claims containing more than one independent claim per category is sent, the applicants are asked to indicate the "special technical features" linking these claims so that a "single general inventive concept" is formed.
3. The application does not meet the requirements of Article 6 PCT, because claim 4 is not clearly formulated. It appears that claim 4 relates to a method and a system. When analysing claims dependent on claim 4, said dependent claims relate to a system. The applicant is requested to remove said inconsistency ("method") within claim 4.
4. The above-mentioned lack of clarity notwithstanding, the subject-matter of **claim 1** appears to be new in the sense of Article 33(2) PCT, and therefore the criteria of Article 33(1) PCT are met.
 - 4.1 The document **D1** is regarded as being the closest prior art to the subject-matter of claim 1 and shows (the references in parentheses applying to this document):
 - a method of controlling security (over load, under/over voltage) in a power system, comprising the steps of (pg 128) :

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- obtaining on-line data of nodal injections, voltages and phases at main nodes, and open/close status of circuit breakers in the power system (pg 133, col. 1, last paragraph),
- establishing initial specifications of controlled parameters (real and reactive power at PQ-nodes, real power and voltage magnitude at PV-nodes, and transformer turns ratios etc.) (pg 133, col. 2, paragraph 1),
- performing Loadflow computation at said nodes of the power system (pg 133, col. 2, paragraph 1; pg 135-136)
- evaluating the computed Loadflow for security (over load, under/over voltage), correcting one or more controlled parameters with said correction (amount of over load and/or under/over voltage) values and repeating the computing and evaluating steps until evaluating step finds a good power system (no over load, no under/over voltage)(pg 133, col. 2, paragraph 3; pg 135-136), and
- effecting a change in the voltages and phases at said nodes of the power system by actually implementing the finally obtained values of controlled parameters after evaluating step finds a good power system (pg 133, col. 2, paragraph 3).

4.2 The subject-matter of claim 1 differs from this known apparatus of D1 in that:

- the Loadflow computation is a Super Decoupled computation in any of the Super Super Decoupled Loadflow methods or any of their hybrid combination or simple variants employing corresponding gain matrices derived from a super decoupled Jacobian matrix for real power with respect to angle and a super decoupled Jacobian matrix for reactive power with respect to voltage, and involving triangular factorization of said gain matrices and computing of discrepancy of real power and reactive power from specified values through such nodes,
- said computing including introducing variables representing quotients of the transformed discrepancies from specified values of real and reactive power flowing in through each node divided by voltage, or square of the voltage in case of transformed real power mismatches in methods employing (1 θ , 1V) iteration scheme, on each node, and using such variables to calculate values of angle and voltage for said transformed discrepancies from specified values of real and reactive power flowing in through each node, by using triangular factorization of said gain matrices for real and reactive power,
- initiating said Loadflow computation with guess solution of the same voltage magnitude and angle as those of the slack (reference) node referred to as slack start,
- restricting nodal transformation angle to maximum-48 degrees, applied to complex power injection in computing said transformed discrepancies from specified values of real and reactive power flowing in through each node

4.3 Object to be achieved: improve convergence and efficiency of the decoupled loadflow computation.

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- 4.4 **Solution:** the object is achieved by limiting rotation angle applied to nodal real and reactive power mismatches to the maximum of -48 degrees.
- 4.5 None of the prior documents at hand disclose or render obvious the solution above.

D2 and D3, i.e., from the same applicant disclose super decoupled load flow methods where the rotation angles are limited to the maximum of -36 degrees.

D4 shows also fast super decoupled load flow method and the convergence behaviour of said method being dependent upon the rotation angle. It is observed that too low or too high rotation angles retards the convergence necessitating large number of iterations to provide a solution. It was found that angles between -40 degrees and -50 degrees could be used for an efficient and reliable solution.

- 4.6 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of **independent method claim 9** is not new in the sense of Article 33(2) PCT.

D1 discusses reactive power generating and consuming devices of a distribution system, their voltage sensitivities and control characteristics. Reactive power flow problems and control strategies in two distribution systems are discussed.

- a method for controlling generator and transformer voltages in an electrical power utility containing plurality of electromechanical rotating machines, transformers and electrical loads connected in a network, each machine having a reactive power characteristic and excitation element which is controllable for adjusting the reactive power generated or absorbed by the machine, and some of the transformers having controllable taps for adjusting terminal voltage (pg 129, col 2-pg 132), said method comprising:
 - creating any of said Super Super Decoupled models ("super super decoupled model" has no well-recognised technical meaning, the intended limitations are not clear and therefore the intended limitations are ignored for the assessment of novelty and inventive step) of the network for providing an indication of the quantity of reactive power to be supplied by the generators in dependence on representations of selected network electrical parameters (pg 133, col. 1, last paragraph-col 2, paragraph 4; pg 135-136 (use of decoupled load flow for analysing power flow and control of reactive),
 - controlling the operation of the excitation element of at least one machine to produce or absorb the amount of reactive power indicated by any of the said Super Super decoupled models with respect to the set of specified parameters (pag 133, col 1- col 2, paragraph 4)

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- 4.7 The additional features of **dependent claims 10 and 11** are also disclosed in D1 (control of excitation of an electrical machine and control of a tap-changing element of a transformer, see pgs 131 and 132).
- 4.8 The subject-matter of the independent apparatus claim 4 (see objections under section 3.) differs from the subject-matter of independent method claim 1 only in that further features have been added.

Thus, the above said under applies to independent claim 4 and as such also meets the requirements of the PCT with respect of novelty and inventive step.

- 4.9 Claims 2-3 are dependent on claim 1, claims 5-8 are dependent on claim 4 and as such also meet the requirements of the PCT with respect to novelty and inventive step.